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**United States Patent** [19]

Freeman et al.

[11] **Patent Number:** **5,594,469**[45] **Date of Patent:** **Jan. 14, 1997**[54] **HAND GESTURE MACHINE CONTROL SYSTEM**[75] Inventors: **William T. Freeman**, Newton, Mass.;  
**Craig D. Weissman**, Coral Springs, Fla.[73] Assignee: **Mitsubishi Electric Information Technology Center America Inc.**, Cambridge, Mass.[21] Appl. No.: **391,955**[22] Filed: **Feb. 21, 1995**[51] Int. Cl.<sup>6</sup> ..... **G09G 5/08**[52] U.S. Cl. .... **345/158; 345/157**[58] Field of Search ..... 345/157, 156,  
345/158, 145, 146; 395/159; 382/291, 203[56] **References Cited****U.S. PATENT DOCUMENTS**

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*Attorney, Agent, or Firm*—Robert K. Tendler, Esq.[57] **ABSTRACT**

A system for the control from a distance of machines having displays includes hand gesture detection in which the hand gesture causes movement of an on-screen hand icon over an on-screen machine control icon, with the hand icon moving the machine control icon in accordance with sensed hand movements to effectuate machine control. In one embodiment, TV control led by hand signals includes detecting a single hand gesture and providing a hand icon on the screen along with the provision of icons representing TV controls such as volume, channel, color, density, etc., in which a television camera detects the hand in a noisy background through correlation techniques based on values of local image orientation. In order to trigger the system into operation, a trigger gesture such as the "how" sign is distinguished from the background through the utilization of orientation angle differences. From correlation values based on correlating local orientations between a mask defining a particular hand and the later acquired image of the hand, normalized correlation scores for each pixel are obtained, with the correlation peak being detected and then thresholded to eliminate false alarms.

**16 Claims, 9 Drawing Sheets**